ELSEVIER Nuclear Instruments and Methods in Physics Research B 148 (1999) xiii–xxiii

NIM B
Beam Interactions with Materials & Atoms

Contents

Editorial xiii

Committees and Sponsors ix

Photographs xi

I. Materials Synthesis Using New Techniques

Low-energy cluster ion beam modification of surfaces
I. Yamada 1
Plasma synthesis of hard materials with energetic ions
O.R. Monteiro 12
Processing of powder surfaces by ion beam techniques
W. Ensinger 17
Comparison of beam-induced deposition using ion microprobe
Y.K. Park, T. Nagai, M. Takai, C. Lehrer, L. Frey and H. Ryssel 25
Pulsed plasma beam mixing of Ti and Mo into Al_2O_3 substrates
J. Piekoszewski, E. Wieser, R. Grötzschel, H. Reuther, Z. Werner and J. Langner 32
Titanium nitride coating on implanted layer using titanium plasma based ion implantation
M. Sano, K. Yukimura, T. Maruyama, S. Kurooka, Y. Suzuki, A. Chayahara, A. Kinomura and Y. Horino 37
Low-energy focused Si ion beam deposition under oxygen atmosphere
J. Yanagisawa, Y. Wang, T. Hada, K. Murase and K. Gamo 42
Ionised cluster beams as a hardness measurement tool
Z. Insepov, R. Manory, J. Matsuo and I. Yamada 47
Factors determining energy values of ion beams for ion-beam deposition
N. Sakudo, K. Hayashi, N. Ikenaga, N. Sakaguchi, K. Moriike, K. Fujimura, M. Okada and T. Maesaka 53
Influence of beam parameters and low-energy electron neutralization on wafer charging during ion implantation
A. Cacciato, A. Heessels and R. Sanders 58
Modelling on plasma immersion implantation of trenches
G. Keller, M. Paulus, S. Mändl, B. Stritzker and B. Rauschenbach 64
Ion implantation into the interior surface of a steel tube by plasma source ion implantation
K. Baba and R. Hatada 69

II. Fundamentals of Surface and Materials Modification

Recoils, flows and explosions: surface damage mechanisms in metals and semiconductors during 50 eV–50 keV ion bombardment
K. Nordlund, J. Keinonen, M. Ghaly and R.S. Averback 74
Amorphization and recrystallization of covalent tetrahedral networks
W. Bolse 83
Self-organised wire growth using ion-implanted reservoirs
S.H. Brongersma 93

0168-583X/99/$ – see front matter © 1999 Elsevier Science B.V. All rights reserved

Early stages of IBAD-film growth: Differences between (100) and polycrystalline Mo substrates
J.C. van der Linden, L.J. Seijbel and B.J. Thijsse 98
Can core/shell nanocrystals be formed by sequential ion implantation? Predictions from kinetic lattice Monte Carlo simulations
M. Strobel, K.-H. Heinig and W. Möller 104
Nano-indentation of ion-beam modified HfN/Si system: Identification of the amorphized inter-layer
R. Nowak, C.L. Li, T. Okada and F. Yoshida 110
The effects of island diffusion and breakup in island growth during ion-beam assisted deposition
M. Rusanen, I. Koponen, J. Heinonen and J. Sillanpää 116
Surface modification with ionised cluster beams: Modelling
Z. Insepov and I. Yamada 121
Cratering in PMMA induced by gold ions: dependence on the projectile velocity
R.M. Papaléo, L.S. Farenzena, M.A. de Araújo, R.P. Livi, M. Alurralde and G. Bermudez. 126
Effect of charge on ion–solid interaction at the surface of two-dimensional materials
T. Takeuchi, M. Yamamoto and M. Kiuchi 132
Ion-induced erosion of organic self-assembled monolayers
P. Cyganik, Z. Postawa, C.A. Meserole, E. Vandeweert and N. Winograd 137
Low energy ion beam deposition with positive and negative ions – experiments to and modeling of subsurface growth
B. Enders, C. Heck, N. Tsubouchi, A. Chayahara, A. Kinomura, Y. Horino and K. Fujii 143
Preparation of smooth Si(001) surfaces by glancing angle sputtering
K. Kimura, A. Fukui, K. Nakajima and M. Mannami 149
Crater formation on the surface of metals and alloys during high power ion beam processing
V.A. Shulov and N.A. Nochovnaya. 154

III. Beam–Solid Interactions

Influence of initial charge and charge state fluctuations on high-energy ion ranges and track formation
F.F. Komarov, A.F. Komarov and A.M. Mironov. 159
Electronic stopping power of ⟨100⟩ axial channeled ^{7}Li ions in Si crystals
J.F. Dias, G. de M. Azevedo, M. Behar, P.L. Grande, Chr. Klatt and S. Kalbitzer 164
Charge equilibration process for channeled He ions along the Si⟨100⟩ direction
G. de M. Azevedo, J.R.A. Kaschny, J.F. Dias, P.L. Grande, M. Behar, Ch. Klatt and S. Kalbitzer 168
Effects of crystal defects on the stopping powers for channeled ions in ion implanted single crystals
E. Kótai 172
Atomic mixing induced by swift heavy ion irradiation of Fe/Zr multilayers
C. Jaouen, A. Michel, J. Pacaud, C. Dufour, Ph. Bauer and B. Gervais 176
Observation of atomic processes in Xe nanocrystals embedded in Al under 1 MeV electron irradiation
K. Mitsuishi, M. Song, K. Furuya, R.C. Birtcher, C.W. Allen and S.E. Donnelly 184
Charge transfer induced critical deformation in ion beam amorphized metallic alloys
P.M. Ossi and R. Pastorelli. 189

IV. Stress, Strain and Defects

Plastic flow produced by single ion impacts on metals
R.C. Birtcher and S.E. Donnelly 194
Enhanced strain relaxation of epitaxial SiGe layers on Si(100) after H^+ ion implantation
B. Holländer, S. Mantl, R. Liedtke, S. Mesters, H.J. Herzog, H. Kibbel and T. Hackbarth 200
Defects formed during 1 MeV Si ion-irradiation of GeSi/Si strained-layer heterostructures at elevated temperatures
J.M. Glasko, R.G. Elliman, J. Zou, D.J.H. Cockayne and J.D. Fitz Gerald 206

Residual stresses and ion implantation effects in Cr thin films
A. Misra, S. Fayeulle, H. Kung, T.E. Mitchell and M. Nastasi 211
Internal stress reduction in diamond like carbon thin films by ion irradiation
D.H. Lee, S. Fayeulle, K.C. Walter and M. Nastasi 216
Activation energy spectra for annealing of ion irradiation induced defects in silica glasses
T. van Dillen, M.L. Brongersma, E. Snoeks and A. Polman 221
Thermal annealing, irradiation, and stress in multilayers
S. Fayeulle, A. Misra, H. Kung and M. Nastasi 227
Post-deposition relaxation of internal stress in sputter-grown HfN thin films bombarded with carbon ions
R. Nowak, F. Yoshida, Y. Miyagawa and S. Miyagawa 232
Measurement of lateral stress in argon implanted thin gold films using quartz resonator techniques
A.S. Way, C. Jeynes and R.P. Webb 238

V. Defects, Doping and Diffusion in Si

Dopant profile engineering of advanced Si MOSFET's using ion implantation
P.A. Stolk, Y.V. Ponomarev, J. Schmitz, A.C.M.C. van Brandenburg, R. Roes, A.H. Montree and P.H. Woerlee 242
Formation, evolution and annihilation of interstitial clusters in ion implanted Si
S. Libertino, S. Coffa, J.L. Benton, K. Halliburton and D.J. Eaglesham 247
Very low energy nitrogen implantation for ultrathin silicon oxynitride film formation
T.D.M. Salgado, F.C. Stedile, C. Krug, I.J.R. Baumvol and C. Radtke 252
Transient enhanced diffusion in preamorphized silicon: the role of the surface
N.E.B. Cowern, D. Alquier, M. Omri, A. Claverie and A. Nejim 257
A lattice kinetic Monte Carlo code for the description of vacancy diffusion and self-organization in Si
A. La Magna, S. Coffa and L. Colombo 262
Structural changes in ultra-high-dose self-implanted crystalline and amorphous silicon
X. Zhu, J.S. Williams and J.C. McCallum 268
Coarsening of End-of-Range defects in ion-implanted silicon annealed in neutral and oxidizing ambients
L.F. Giles, M. Omri, B. de Mauduit, A. Claverie, D. Skarlatos, D. Tsoukalas and A. Nejim 273
Boron diffusion in Si and SiC during 2.5 MeV proton irradiation at 500–850°C
A.Yu. Kuznetsov, M. Janson, A. Hallén, B.G. Svensson and A. Nylandsted Larsen 279
Amorphization of Si(001) by ultra low energy (0.5–5 keV) ion implantation observed with high-resolution RBS
K. Kimura, A. Agarwal, H. Toyofuku, K. Nakajima and H.-J. Gossmann 284
Removal of vacancy type clusters by low energy ion generated self-interstitials in crystalline silicon
A.V. Fedorov, A. van Veen, H. Schut and A. Rivera 289
Oxygen implanted silicon investigated by positron annihilation spectroscopy
A.C. Kruseman, H. Schut, A. van Veen and M. Fujinami 294
Electrical characterization and annealing properties of electrically active defects introduced in n-Si during sputter etching in an Ar-plasma
P.N.K. Deenapanray, F.D. Auret and G. Myburg 300
Reverse annealing effects in heavy ion implanted silicon
P. Pellegrino, N. Keskitalo, A. Hallén and B.G. Svensson 306
Microstructural evolution of oxygen implanted silicon during annealing processes
M. Ishimaru, T. Tsunemori, S. Harada, M. Arita and T. Motooka 311
Laser annealing of implanted silicon with temperature-controlled transparency
R.M. Bayazitov, M.F. Galyautdinov, R.I. Batalov, I.B. Khaibullin and R. Groetzchel 317
Simulation of metallic impurity gettering in silicon by MeV ion implantation
R.A. Brown, O. Kononchuk and G.A. Rozgonyi 322
The effects of the annealing temperature on the formation of helium-filled structures in silicon
P.F.P. Fichtner, J.R. Kaschny, M. Behar, R.A. Yankov, A. Mücklich and W. Skorupa 329

Distribution of gettering centres at a buried amorphous layer in silicon
R. Kögler, F. Eichhorn, A. Mücklich, A.B. Danilin and W. Skorupa 334
Self ion irradiated Si probed with enhanced depth resolution positron annihilation spectroscopy
A.P. Knights, A. Nejim, N.P. Barradas and P.G. Coleman 340
Electron beam induced regrowth of ion implantation damage in Si and Ge
I. Jenčič, I.M. Robertson and J. Skvarč 345
The kinetics of dopant-enhanced solid phase epitaxy in H-free amorphous silicon layers
J.C. McCallum 350
Mechanical properties of bismuth implanted amorphous Ge film
A. Juhász, P. Szommer, J. Lendvai, Z. Vértesy and G. Pető 355
Edge supported amorphous silicon membranes for diffraction studies
S. Roorda, K. Laaziri and S.C. Gujrathi 360
Low temperature relaxation in amorphous silicon made by ion implantation
S. Roorda 366
Activation energies for light ions in ion beam induced epitaxial crystallization
A. Kinomura, A. Chayahara, N. Tsubouchi, Y. Horino and J.S. Williams 370
MD simulations of ion beam induced epitaxial crystallization at a-Si/c-Si interfaces: interface structure and elementary processes of crystallization
B. Weber, D.M. Stock and K. Gärtner 375

VI. Defects and Dopants in Compound Semiconductors

Ion implantation induced selective area exfoliation of InP and GaAs
T.W. Simpson, I.V. Mitchell, G.O. Este and F.R. Shepherd 381
Ion-implanted hydrogen in gallium nitride
S.M. Myers, J. Han, T.J. Headley, C.R. Hills, G.A. Petersen, C.H. Seager and W.R. Wampler 386
Atomic-level characterisation of ion-induced amorphisation in compound semiconductors
M.C. Ridgway, C.J. Glover, E. Bezakova, A.P. Byrne, G.J. Foran and K.M. Yu 391
Influence of substrate temperature on damage buildup and removal of ion implanted gallium nitride
C. Liu, A. Wenzel, K. Volz and B. Rauschenbach 396
Low temperature transformations of defects in GaAs and AlGaAs
A. Turos, A. Stonert, B. Breeger, E. Wendler, W. Wesch and R. Fromknecht 401
Low-energy ion assisted deposition of epitaxial gallium nitride films
J.W. Gerlach, D. Schrupp, K. Volz, M. Zeitler, B. Rauschenbach and A. Anders 406
Semi-insulating behaviour in Fe MeV implanted n-type InP
A. Gasparotto, A. Carnera, A. Paccagnella, B. Fraboni, F. Priolo, E. Gombia, R. Mosca and G. Rossetto 411
Ion-implantation in SiC and GaN
N. Papanicolaou, M.V. Rao, B. Molnar, J. Tucker, A. Edwards, O.W. Holland and M.C. Ridgway 416
Electrical behaviour of high energy ^{120}Sn implantation in n- and p-type GaAs
A.M. Narsale, Y. Pyar Ali and B.M. Arora 421
Comparison of nucleation and growth of the crystalline and amorphous phase during MeV-ion irradiation of amorphous/crystalline interfaces
E. Glaser, T. Fehlhaber and B. Breeger 426
Characterization of GaN synthesized in N-ion implanted GaAs
K. Kuriyama, T. Tsunoda, N. Hayashi and Y. Takahashi 432
Electrical characterization of low temperature He-ion irradiated GaN
M. Hayes, S.A. Goodman and F.D. Auret 437
Schottky barrier modification and electrical characterization of low energy He-ion bombardment induced defects in n- and p-type GaAs
M.J. Legodi, F.D. Auret, S.A. Goodman and J.B. Malherbe 441
Proton irradiation of n-type GaAs
S.A. Goodman, F.D. Auret, M. Ridgway and G. Myburg 446

Physical sputtering of III–V-semiconductors with a focused Ga^+-beam
R. Menzel, T. Bachmann and W. Wesch 450
Characterization of Mg^+-implanted InP by Raman spectroscopy
J. Ibáñez, R. Cuscó, N. Blanco, G. González-Díaz and L. Artús 454
Acceptor profile control in GaAs using co-implantation of Zn and P
S. Hutchinson, R. Gwilliam, M.J. Kelly, B.J. Sealy, A. Chew and J. Stephens 459
RBS and ERDA study of ion beam synthesised amorphous gallium nitride
N.P. Barradas, S.A. Almeida, C. Jeynes, A.P. Knights, S.R.P. Silva and B.J. Sealy 463
In situ RBS investigation of damage production during ion implantation in $Al_xGa_{1-x}As$ at 20 K
B. Breeger, E. Wendler, Ch. Schubert and W. Wesch 468
Emission kinetics of electron traps introduced in n-GaN during He-ion irradiation
F.D. Auret, S.A. Goodman, M.J. Legodi and W.E. Meyer 474
Bulk unipolar diodes formed in GaAs by ion implantation
S. Hutchinson, M.J. Kelly, R. Gwilliam, B.J. Sealy and M. Carr 478

VII. Optical Doping of Semiconductors

Luminescence from Er and Tb implanted into MOS tunnel diodes
S. Wang, H. Amekura, A. Eckau, R. Carius and Ch. Buchal 481
Energy transfer efficiency of the 1.54 μm luminescence of Er-implanted silicon in relation to post-implantation annealing and impurity coimplantation
T. Kimura, T. Nakanose, W. Wang, H. Isshiki and R. Saito 486
Lattice sites and damage annealing of Er in low-dose implanted GaAs
U. Wahl, A. Vantomme, G. Langouche and The ISOLDE collaboration 492
Optical and electrical doping of silicon with holmium
J.F. Suyver, P.G. Kik, T. Kimura, A. Polman, G. Franzò and S. Coffa 497
Er-related emission in nitrogen co-implanted $Al_xGa_{1-x}As$:Er ($X = 0.15, 0.37, 0.70$)
S. Uekusa, K. Utiya, M. Wakutani and M. Kumagai 502
Luminescence properties of Er implanted p-type and n-type 3C SiC/Si
K. Awahara, S. Uekusa, T. Goto, T. Kobayashi and M. Kumagai 507
The influence of implantation and annealing conditions on optical activity of Er^{3+} ions in 6H SiC
A. Kozanecki, C. Jeynes, N.P. Barradas, B.J. Sealy and W. Jantsch 512
Boundary conditions for formation of Er–O optical centers in Er- and O-coimplanted Si
K. Nakashima, O. Eryu, A. Saito, T. Nakata and M. Watanabe 517
Deep level properties of erbium implanted epitaxially grown SiGe
M. Mamor, F.D. Auret, S.A. Goodman, J. Brink, M. Hayes, F. Meyer, A. Vantomme, G. Langouche and P.N.K. Deenapanray 523

VIII. Silicon Carbide, Silicon Nitride

Mechanisms in the ion beam synthesis of SiC layers in silicon
J.K.N. Lindner and B. Stritzker 528
The role of Fe on the crystallisation of α-Si_3N_4 from amorphous Si–N formed by ion implantation
Z.L. Li, J. Wong-Leung, P.N.K. Deenapanray, M. Conway, D.J. Chivers, J.D. Fitz Gerald and J.S. Williams 534
Formation of crystalline SiC films by CH_4 plasma immersion ion implantation into Si
K. Volz, B. Rauschenbach, B. Stritzker and W. Ensinger 540
Ion beam processing of SiC for optical application
W. Wesch, A. Heft, R. Menzel, T. Bachmann, G. Peiter, H. Hobert, T. Höche, P. Dannberg and A. Bräuer 545
Phase formation in silicon carbide, silicon, and glassy carbon after high-dose titanium implantation using a MEVVA ion source
J.K.N. Lindner, K. Baba, R. Hatada and B. Stritzker 551

Displacement energy measurements for ion-irradiated 6H-SiC
W. Jiang, W.J. Weber, S. Thevuthasan and D.E. McCready 557
Damage formation and recovery in C^+-irradiated 6H-SiC
W. Jiang, W.J. Weber, S. Thevuthasan and D.E. McCready 562
Preservation of polytypic structure in implanted 4H-SiC($1\bar{1}00$)
M. Satoh, K. Okamoto, Y. Nakaike, K. Kuriyama, M. Kanaya and N. Ohtani 567
Binary collision approximation modeling of ion-induced damage effects in crystalline 6H-SiC
G. Lulli, E. Albertazzi, M. Bianconi and R. Nipoti 573
Luminescence quenching in 150 keV proton irradiated a-SiC:H
R. Reitano, P. Musumeci, P. Baeri and G. Foti 578
Ion beam irradiation of relaxed amorphous silicon carbide
L. Calcagno, P. Musumeci and M.G. Grimaldi 583
Ion beam induced crystallization effect and growth kinetics of buried SiC layers formed by carbon implantation into silicon
D. Chen, W.Y. Cheung and S.P. Wong 589
Effects of ion beam irradiation on the crystallization of Si–C films
S. Hishita, K. Oyoshi, S. Suehara and T. Aizawa 594
Mechanical properties of silicon oxynitride thin films prepared by low energy ion beam assisted deposition
Y. Shima, H. Hasuyama, T. Kondoh, Y. Imaoka, T. Watari, K. Baba and R. Hatada 599

IX. Silicides

Ion beam synthesized cobalt germanide alloy by metal vapor vacuum arc implantation
C.S. Lee, I.H. Wilson, W.Y. Cheung, Y.J. Chen, J.B. Xu and S.P. Wong 604
Dwell-time effects in focused ion beam synthesis of cobalt disilicide: reflectivity measurements
S. Hausmann, L. Bischoff, M. Voelskow, J. Teichert, W. Möller and H. Fuhrmann 610
High current Ni-ion implantation to synthesize $NiSi_2$ layers on Si with very low resistivity
K.Y. Gao and B.X. Liu 615
Epitaxial ternary $Er_{0.5}Y_{0.5}Si_{1.7}$ silicide layers formed by channeled ion beam synthesis
S.M. Hogg, A. Vantomme, M.F. Wu, S. Yao, H. Pattyn and G. Langouche 621

X. Carbon-based Materials, Diamond

The nature of damage in ion-implanted and annealed diamond
R. Kalish, A. Reznik, K.W. Nugent and S. Prawer 626
The effect of fluence on the hardening of C_{60} films irradiated with He and N ions
C.E. Foerster, F.C. Serbena, C.M. Lepienski, D.L. Baptista and F.C. Zawislak 634
Surface treatment of diamond films with Ar and O_2 cluster ion beams
N. Toyoda, N. Hagiwara, J. Matsuo and I. Yamada 639
Effect of Ar^+, N_2^+, He^+ and H_2^+ bombardment on the composition and structure of CN_x layers
I. Bertóti, M. Mohai, A. Tóth and B. Zelei 645
CN molecular negative-ion beam deposition and ion energy dependence of atomic bonds between carbon and nitrogen in the films
H. Tsuji, T. Yoshihara, S. Nakamura, Y. Gotoh and J. Ishikawa 650
Preparation of hydrophobic diamond like carbon films by plasma source ion implantation
R. Hatada and K. Baba 655
Tribological properties of nitrogen implanted diamond-like carbon
S. Miyagawa, M. Ikeyama, S. Nakao, K. Saitoh, Y. Miyagawa, K. Baba and R. Hatada 659
Evaluation of raw hardness of DLC thin films prepared by IBAD
Y. Funada, K. Awazu, H. Yasui and T. Sugita 664

The investigation of optical and electrical properties of N^+-implanted amorphous diamond-like carbon (DLC) films
I.A. Faizrakhmanov, V.V. Bazarov, V.A. Zhikharev and I.B. Khaibullin 669
Growth of carbon thin film by low-energy mass-selected ion beam deposition
H. Ohno, J.A. van den Berg, S. Nagai and D.G. Armour 673

XI. Insulators

Improvement of the photorefractive response of Fe-doped $KNbO_3$ crystals by MeV proton irradiation
D. Fluck, S. Brülisauer, P. Günter, Ch. Buchal and L. Beckers 678
Temperature dependence of ion-beam induced amorphization in α-quartz
S. Dhar, W. Bolse and K.-P. Lieb 683
Effect of proton implantation on the photosensitivity of SMF-28 optical fiber
A.L. Tchebotareva, J.L. Brebner, S. Roorda and J. Albert 687
Network modification and epitaxial recrystallisation of ion-implanted α-quartz
F. Roccaforte, W. Bolse and K.P. Lieb 692
Optical rotation in a $Bi_4Ge_3O_{12}$: RE surface modified by He-ion beam implantation
A.K. Jazmati, P.D. Townsend 698
Ion irradiation-induced phase transformation of pyrochlore and zirconolite
S.X. Wang, L.M. Wang, R.C. Ewing, G.S. Was and G.R. Lumpkin 704
He^+ implantation for waveguide fabrication in KTP and Rb:KTP
Th. Opfermann, T. Bachmann, W. Wesch and M. Rottschalk 710
Modification of ALE-grown SrS thin films by ion implantation of Cu and codopants
T. Sajavaara, R. Lappalainen, K. Arstila, W.-M. Li, M. Ritala, M. Leskelä and E. Soininen 715
Damage evolution in TiC crystals during hydrogen and helium dual-ion beam irradiation
K. Hojou, H. Otsu, S. Furuno, K.N. Kushita, N. Sasajima and K. Izui 720
Synthesis of Ti:sapphire by ion implantation
J.C. McCallum and L.D. Morpeth 726
Effect of crystal orientation on damage accumulation and post-implantation annealing for iron implantation into sapphire
C.J. McHargue, E. Alves, M.F. da Silva and J.C. Soares 730
Mechanical property changes of amorphous alumina induced by ion implantation
M. Ikeyama, P. Jin and M. Tazawa 735
Ceramic surface modification by a keV ion irradiation
W.K. Choi, S.C. Choi, H.-J. Jung and S.K. Koh 740
Damage accumulation in Al_2O_3 during H_2^+ or He^+ ion irradiation
N. Sasajima, T. Matsui, S. Furuno, K. Hojou and H. Otsu 745
Oxidation state and lattice site occupation of ions implanted into rutile
O. Meyer, R. Fromknecht and I. Khubeis 752
Ion-beam modification of TiO_2 film to multilayered photocatalyst
T. Sumita, H. Otsuka, H. Kubota, M. Nagata, Y. Honda, R. Miyagawa, T. Tsurushima and T. Sadoh 758
Tin implanted in rutile single crystals: disorder, lattice location and the influence of the analyzing He-beam
I. Khubeis, R. Fromknecht and O. Meyer 762
The formation of microvoids in MgO by helium ion implantation and thermal annealing
A. van Veen, H. Schut, A.V. Fedorov, F. Labohm, E.A.C. Neeft and R.J.M. Konings 768
Thermal fatigue of ion implanted magnesium oxide crystals
V.N. Gurarie, D.N. Jamieson, A.V. Orlov, J.S. Williams and M. Conway 773
Ion beam mixing of the ZrO_2/Fe system
A. Turos, G. Gawlik, J. Jagielski, A. Stonert, W. Matz and R. Groetzschel 778
Retention of iodine in yttria stabilized zirconia
M.A. Pouchon, M. Döbeli and C. Degueldre 783

Optical absorption and thermoluminescence of $MgAl_2O_4$ spinel crystals implanted with Xe^{++} ions
I.V. Afanasyev-Charkin, V.T. Gritsyna, D.W. Cooke, B.L. Bennett, C.R. Evans, M.G. Hollander and K.E. Sickafus 787
Textured CeO_2 buffer layers on amorphous substrates by ion beam assisted deposition
M.Q. Huang, J. Geerk, S. Massing, O. Meyer, H. Reiner and G. Linker 793
Channeling ion beam induced crystalline quality improvement of epitaxial CeO_2 films
Y. Yamamoto, K. Yamaguchi, M. Taya, M. Muraoka, M. Satoh and T. Inoue 798
$YBa_2Cu_3O_{7-\delta}$ Josephson junctions fabricated by oxygen implantation
F. Kahlmann, A. Engelhardt, J. Schubert, W. Zander, Ch. Buchal and J. Hollkott 803
Stability and diffusion of Hg implanted $YBa_2Cu_3O_{6+\delta}$
J.P. Araújo, J.G. Correia, U. Wahl, J.G. Marques, E. Alves, V.S. Amaral, A.A. Lourenco, V. Galindo, T. von Papen, J.P. Senateur, F. Weiss, A. Vantomme, G. Langouche, A.A. Melo, M.F. da Silva, J.C. Soares, J.B. Sousa and the ISOLDE Collaboration 807

XII. Phase Formation in Metals

Characterization and giant magnetoresistance effect in cobalt–silver granular films formed by MEVVA implantation
S.P. Wong, M.F. Chiah, W.Y. Cheung, N. Ke and J.B. Xu 813
Study of the influence of surface carbon on the tribological properties of ion-treated steels
A. Benyagoub and A. Faussemagne 819
Effects of high energy nitrogen implantation on stainless steel microstructure
H. Pelletier, P. Mille, A. Cornet, J.J. Grob, J.P. Stoquert and D. Muller 824
N-ion implantation assisted by preparative and closing implantation for surface modification of tool steel
T. Vilaithong, L.D. Yu, P. Vichaisirimongkol, G. Rujijanagul and T. Sonkaew 830
The Fe–N system: phase transformations induced by the concomitant use of heavy ion bombardment and temperature
E.C. Moreira, M. Behar and L. Amaral 836
CEMS-investigations of AISI M2 steel after nitrogen plasma immersion ion implantation
V.V. Uglov, A.L. Kholmetskii, A.K. Kuleshov, J.A. Fedotova, D.P. Rusalsky, V.V. Khodasevich, K. Ruebenbauer, E. Richter, R. Guenzel and S. Parascandola 841
Nitrogen plasma immersion ion implantation into high speed steel
S. Mändl, E. Richter, R. Günzel and W. Möller 846
Phase formation in titanium after high-fluence oxygen ion implantation
C. Hammerl, B. Renner, B. Rauschenbach and W. Assmann 851
Improvement of the high temperature oxidation resistance of Ti50Al via ion-implantation
U. Hornauer, E. Richter, E. Wieser, W. Möller, G. Schumacher, C. Lang and M. Schütze 858
Behavior of implanted nitrogen in Zr/carbon bilayer
Y. Miyagawa, K. Baba, R. Hatada, S. Nakao, M. Ikeyama and S. Miyagawa 863
Enhancement of oxidation resistance in Cu and Cu(Al) thin layers
Z.E. Horváth, G. Pető, Z. Pászti, É. Zsoldos, E. Szilágyi, G. Battistig, T. Lohner, G.L. Molnár and J. Gyulai 868

XIII. IBAD, Defects, and Mixing in Metals

Ion beam induced magnetic nanostructure patterning
H. Bernas, T. Devolder, C. Chappert, J. Ferré, V. Kottler, Y. Chen, C. Vieu, J.P. Jamet, V. Mathet, E. Cambril, O. Kaitasov, S. Lemerle, F. Rousseaux and H. Launois 872
Linkage between crystallographic texture and surface roughness in niobium films synthesized by ion beam assisted deposition
H. Ji and G.S. Was 880

Structural analysis of Si/Fe and Mo/Fe ion-beam mixed layers
J. Jagielski, M. Kopcewicz, A. Turos and F. Eichhorn 886
Defect clusters in high-energy ion-irradiated Ni and dilute Ni alloys investigated by diffuse X-ray scattering
H. Yuya, T. Matsui, H. Maeta, H. Ohtsuka and H. Sugai 891
Low temperature ion bombardment of $Bi_{30}Pd_{70}$-films – influence of the initial structure on the phase formation
R. Durner, B. Heinz and P. Ziemann 896
Amorphization of metal films by low temperature ion irradiation. An in situ PAC-study for $AuIn_2$ and In_3Pd films
A. Plewnia, B. Heinz and P. Ziemann 901
Deposition of magnetic thin films by IBAD
T. Sikol, J. Spousta, L. Dittrichová, M. Stránský, J. Zlámal, F. Matejka, A. Nebojsa, J. Zemek, V. Perina, D. Rafaja and L. Ranno 907
An advanced apparatus for ion beam assisted sputter coating of the inner walls of tubes
T. Kraus, R. Kern, B. Stritzker and W. Ensinger 912
Optimisation of TiN-IBAD coatings for wear reduction and corrosion protection
E. Vera and G.K. Wolf 917
Ion beam assisted deposition of niobium nitride thin films for vacuum microelectronics devices
Y. Gotoh, M. Nagao, T. Ura, H. Tsuji and J. Ishikawa 925
Diffusion processes in metal/ceramic interfaces under heavy ion irradiation
R. Nagel, H. Hahn and A.G. Balogh 930
New magnetic properties by ion beam mixing: Ag/Fe/Ag-(001)-films with tetragonal symmetry
D. Kurowski, K. Brand and J. Pelzl 936
Study of micromechanical properties of ion-beam mixed layers
J. Jagielski, G. Gawlik, A. Turos, A. Piatkowska, D. Tréheux, L. Starczewski and M. Szudrowicz 941
Sequential disordering during ion-induced amorphization in the Mo–Fe multilayered films
C. Lin, Y.G. Chen and B.X. Liu 946
Effects of Ne- and Ar-ion irradiations on Ni/SiO_2 bilayers
K.-P. Lieb, M. Schwickert, W. Bolse, M. Gustafsson, J. Jokinen and J. Keinonen 951

XIV. Semiconductor Nanoparticles

Microstructure of sulfide nanocrystals formed by ion-implantation
A. Meldrum, C.W. White, L.A. Boatner, I.M. Anderson, R.A. Zuhr, E. Sonder, J.D. Budai and D.O. Henderson 957
Nonlinear optical properties of semiconducting nanocrystals in fused silica
A. Dowd, M. Samoc, B. Luther-Davies and R.G. Elliman 964
Precipitation, ripening and chemical effects during annealing of Ge^+ implanted SiO_2 layers
K.H. Heinig, B. Schmidt, A. Markwitz, R. Grötzschel, M. Strobel and S. Oswald 969
Ion beam effects on the formation of Ge and Si nanoclusters in silica thin films
C.A. Carosella, S. Schiestel, R.M. Stroud, K.S. Grabowski, C. Kendziora and M. Stoiber 975
Light emission from ion beam induced silicon nanoclusters in silicon dioxide: role of cluster–cluster interactions via a thin oxide
T. Shimizu-Iwayama, D.E. Hole and P.D. Townsend 980
The effect of ion dose and annealing ambient on room temperature photoluminescence from Si nanocrystals in SiO_2
S. Cheylan and R.G. Elliman 986
Formation of CdS and CdSe nanocrystals by sequential implantation
C.W. White, A. Meldrum, J.D. Budai, S.P. Withrow, E. Sonder, R.A. Zuhr, D.M. Hembree Jr., M. Wu and D.O. Henderson 991
Blue electroluminescence from high dose Si^+ implantation in SiO_2
D. Muller, P. Knápek, J. Fauré, B. Prevot, J.J. Grob, B. Hönerlage and I. Pelant 997

Photoluminescence properties of thermal SiO_2 films implanted by silicon and nitrogen ions
J. Zhao, Y.H. Yu, D.S. Mao, Z.X. Lin, B.Y. Jiang, G.Q. Yang, X.H. Liu and S. Zou 1002

XV. Metallic Nanoparticles

Nanocluster formation in silicate glasses by sequential ion implantation procedures
E. Cattaruzza, G. Battaglin, R. Polloni, T. Cesca, F. Gonella, G. Mattei, C. Maurizio, P. Mazzoldi, F. D'Acapito, F. Zontone and R. Bertoncello 1007
Post-implantation bombardment assisted formation of colloidal Au in silica
D. Ila, E.K. Williams, C.C. Smith, D.B. Poker, D.K. Hensley, C. Klatt and S. Kalbitzer 1012
Self-assembled two-dimensional distribution of nanoparticles with high-current Cu^- implantation into insulators
N. Kishimoto, N. Umeda, Y. Takeda, C.G. Lee and V.T. Gritsyna 1017
Synthesis of metal/polymer composite films by implantation of Fe and Ag ions in viscous and solid state silicone substrates
R.I. Khaibullin, Y.N. Osin, A.L. Stepanov and I.B. Khaibullin 1023
Linear and nonlinear optical properties of Cu nanoparticles fabricated by high-current Cu^- implantation in silica glass
Y. Takeda, V.T. Gritsyna, N. Umeda, C.G. Lee and N. Kishimoto 1029
Nanosized lead inclusions in silicon produced by ion implantation
E. Johnson, A. Johansen, L. Sarholt and U. Dahmen 1034
Structural and magnetic properties of Fe ion implanted Al_2O_3
I. Sakamoto, S. Honda, H. Tanoue, N. Hayashi and H. Yamane 1039
Optical and structural properties of chromium implanted lithium niobate – cluster formation and substitutional incorporation
A. Kling, J.C. Soares and M.F. da Silva 1044
Formation of coherent precipitates of platinum in sapphire
E. Alves, R.C. da Silva, O. Conde, M.F. da Silva and J.C. Soares 1049
Dependence of optical properties of implanted silver nanoparticles in float glass on substrate temperature
D.E. Hole, A.L. Stepanov and P.D. Townsend 1054
Properties of metallic ions implanted into sapphire
T. Kobayashi and T. Terai 1059
Ion beam synthesis of Au and Cu nanoclusters in MgO
R.L. Zimmerman, D. Ila, E.K. Williams, D.B. Poker, D.K. Hensley, C. Klatt and S. Kalbitzer 1064
New techniques for optical absorption measurement of implanted nanoparticles in float glass
I. Okur, P.D. Townsend and P.J. Chandler 1069
Characterization of silver colloids formed in $LiBbO_3$ by Ag and O implantation at room and elevated temperatures
E.K. Williams, D. Ila, A. Darwish, D.B. Poker, S.S. Sarkisov, M.J. Curley, J.-C. Wang, V.L. Svetchnikov and H.W. Zandbergen 1074

XVI. Organic Materials

Cell adhesion on low-energy ion beam-irradiated polysiloxane surfaces
C. Satriano, G. Marletta and E. Conte 1079
Micromachining using focused high energy ion beams: Deep Ion Beam Lithography
J.A. van Kan, J.L. Sanchez, B. Xu, T. Osipowicz and F. Watt 1085
Metal ion implantation and dynamic ion mixing for the protection of high-performance polymers from severe oxidative environment
Z.A. Iskanderova, J.I. Kleiman, Y. Gudimenko, A. Tkachenko, R.C. Tennyson, I.G. Brown and O.R. Monteiro 1090

Modification of alkanethiol self-assembled monolayers on Au by single-ion irradiation
H. Ogiso, T. Ishida, W. Mizutani, S. Nakano and H. Tokumoto 1097
Carbon nanotubes produced by high energy (E>100 MeV), heavy ion irradiation of graphite
L.P. Biró, B. Szabó, G.I. Márk, J. Gyulai, K. Havancsák, J. Kürti, A. Dunlop, L. Frey and H. Ryssel. . 1102
Structure evolution of implanted polymers: Buried conductive layer formation
V.N. Popok, I.A. Karpovich, V.B. Odzhaev and D.V. Sviridov 1106
Thermal stability of He irradiated photoresist films
I.T.S. Garcia, F.C. Zawislak and D. Samios. 1111
Paramagnetic defects in modified carbon-containing semiconductors
I.I. Azarko, I.P. Kozlov, E.I. Kozlova and V.N. Popok 1116
Effects of H-implantation energy on the optical stability of implanted urushi films under photo-irradiation
K. Awazu, H. Yasui, M. Kasamori, T. Ichikawa, Y. Funada and M. Iwaki 1121
High fluence boron implantation into polyimide
J. Vacík, V. Hnatowicz, J. Cervená, V. Perina, V. Popok, V. Odzhaev and D. Fink..... 1126
Surface modification of polyethylene by low keV ion beams
A. Tóth, T. Bell, I. Bertóti, M. Mohai and B. Zelei 1131
Negative-ion beam surface modification of tissue-culture polystyrene dishes for changing hydrophilic and cell-attachment properties
H. Tsuji, H. Satoh, S. Ikeda, S. Ikemura, Y. Gotoh and J. Ishikawa 1136
Ion beam modification of PES, PS and PVC polymers
A.L. Evelyn, D. Ila, R.L. Zimmerman, K. Bhat, D.B. Poker, D.K. Hensley, C. Klatt, S. Kalbitzer, N. Just and C. Drevet 1141

Author index 1147